Lipids, Isotopes, and Coral Bleaching

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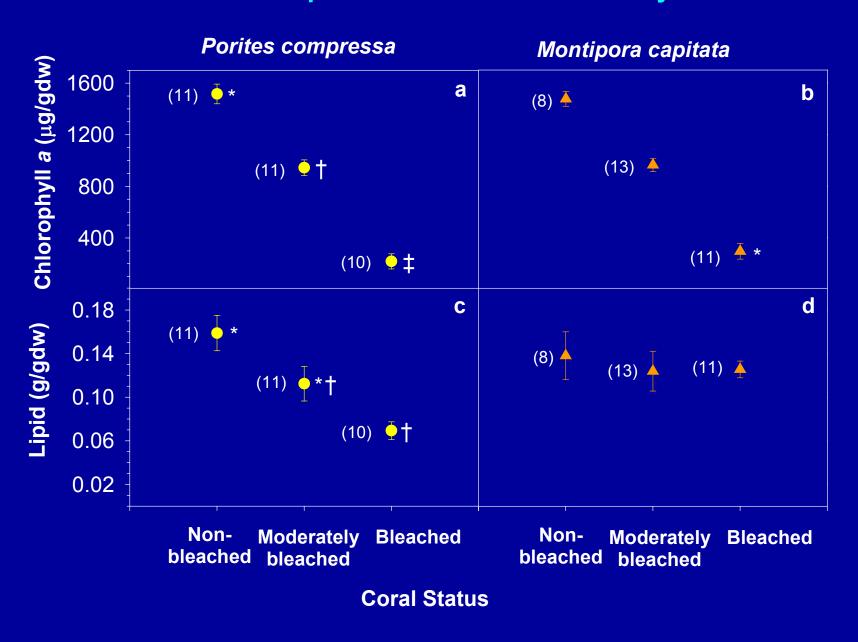


Healthy, bleached, and recovered Porites compressa corals

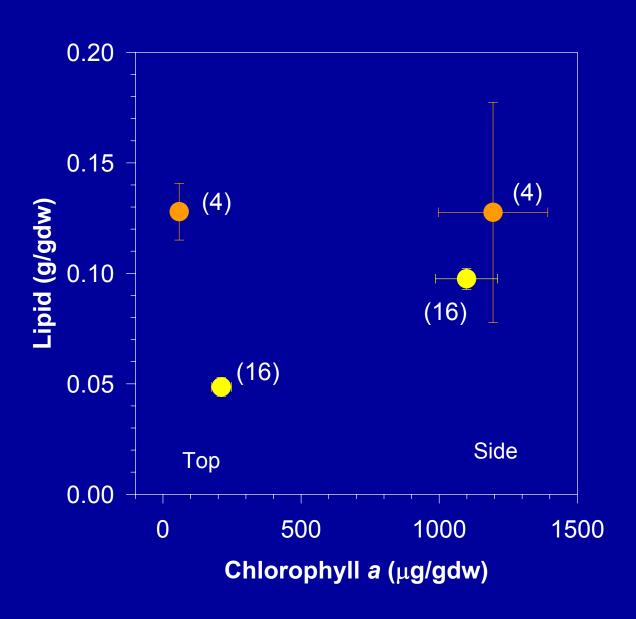
Bleaching in Corals:

- Total lipid reserves
- Lipid classes
- Skeletal stable isotopic composition

Total Lipids in bleached and healthy corals



Lipids on top and side of colony



Total Lipids

- *P. compressa* consume their stored lipid reserves in response to bleaching while *M. capitata* conserve them
- M. capitata may be increasing heterotrophy and/or reduced metabolic rate when bleached
- *P. compressa* does not re-allocate lipid resources within the colony

Lipid class composition of bleached and healthy corals

Species	P. compressa				M.capitata			
Health Status	Bleached		Non-bleached		Bleached		Non-bleached	
ID	PC07	PC30	PC22	PC44	MC74	MC80	MC68	MC79
Lipid Class*								
PL	61.05	58.22	50.70	36.13	56.52	61.46	45.53	49.74
DAG	ND	ND	ND	ND	34.72	29.48	20.42	33.51
CS	12.69	13.74	9.39	6.38	3.91	4.01	3.90	2.47
FFA	26.26	28.04	25.01	28.70	4.86	5.05	19.62	9.36
TG	12.30	9.97	26.62	31.17	ND	ND	17.30	9.80
WE (or HC)	ND	ND	14.90	28.78	ND	ND	10.54	4.92

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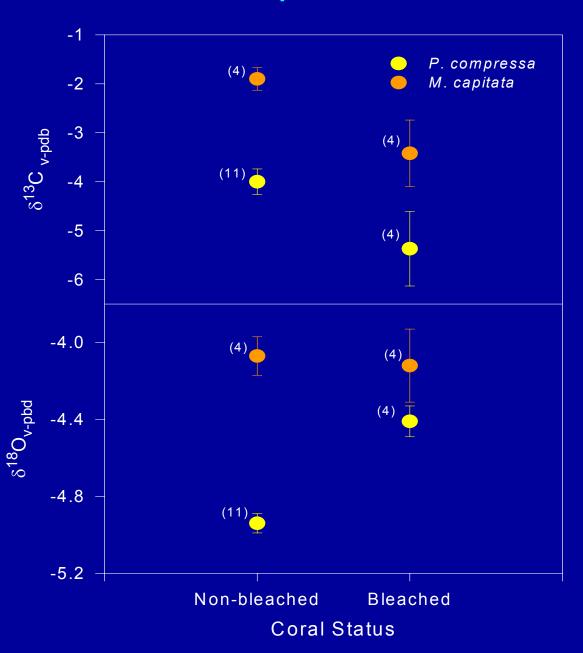
Lipid classes

• P. compressa and M. capitata both use up their WE and TG when bleached

- M. capitata shift lipid resources into DAG
- P. compressa never has DAG

• Perhaps absence of DAG is diagnostic of corals that consume total lipids when bleached

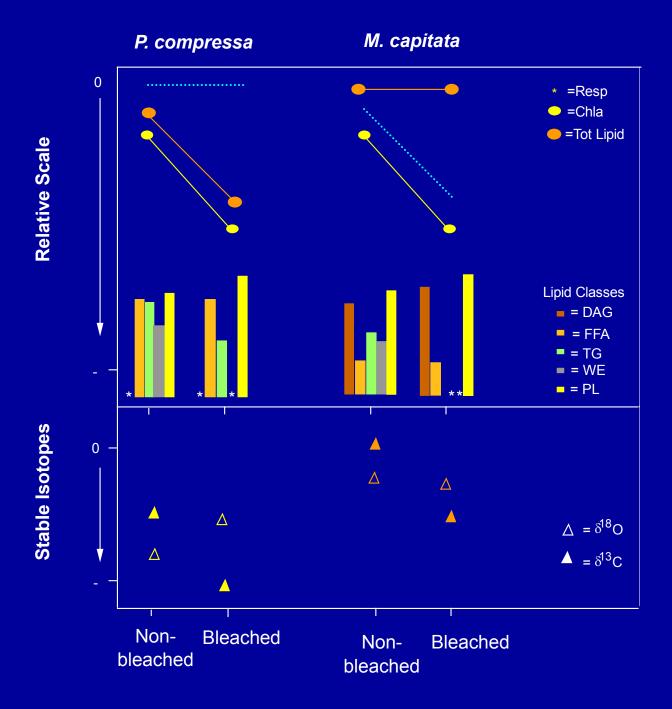
Stable isotopes in coral skeleton



Skeletal stable isotope

>δ¹³C decreases with bleaching in both species

- $\triangleright \delta^{18}$ O does not change in *M. capitata*
- $\triangleright \delta^{18}$ O increases in bleached *P. compressa*



Conclusions

• Bleached *P. compressa* use up their lipid reserves and *M. capitata* conserve them

• *M. capitata* may have lower metabolic rates than *P. compressa*, or be able to lower their metabolic rates when bleached

• Two lipid class strategies: consume and grow or conserve and slow growth

Conclusions (cont)

- Lack of DAG may be diagnostic of corals that consume their lipids when bleached
- Skeletal stable carbon isotopes indicate that photosynthesis has decreased in both species
- Skeletal stable oxygen isotopes indicate that growth may have stopped in bleached *P. compressa*
- Are *M. capitata* are more likely to survive bleaching events than *P. compressa*?

Future Research

- Growth and respiration rates in bleached and non-bleached corals
- Bleaching and recovery
 - lipids, lipid classes, metabolism and stable isotopes in skeleton and tissue
- Isotopic composition of lipid classes and compound specific lipids
- Other coral species/locations